Andreea Bobu

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Research Interests

I work at the intersection of robotics, machine learning, and mathematical human modeling. Specifically, I study algorithmic human-robot interaction, with a focus on how autonomous agents and humans can efficiently and interactively arrive at shared representations of their tasks for more seamless and reliable interaction.

Position

August 2023 – July 2024 **Research Scientist**
Boston Dynamics AI Institute (BDAII)

Fall 2024 **Boeing Assistant Professor**
Massachusetts Institute of Technology (MIT), Department of Aeronautics and Astronautics

Education

2017–2023 **Ph.D. in Electrical Engineering and Computer Science**
University of California, Berkeley.
GPA: 4.0/4.0
Advisor: Anca Dragan
Thesis: Aligning Robot Representations with Humans

2013–2017 **B.S. in Computer Science and Engineering, Minor in Mathematics**
Massachusetts Institute of Technology (MIT).
GPA: 5.0/5.0
Advisors: Adrian Dalca, Polina Golland, Stefanie Jegelka

Awards and Recognitions

2022 **Rising Stars Academic Career Workshop in EECS**
Chosen to participate in an intensive workshop for historically marginalized graduate students and postdocs who are interested in pursuing academic careers in EE, CS, and AI and decision-making.

2022 **Robotics: Science and Systems (RSS) Pioneers**
Selected for workshop bringing together top early career researchers in robotics.

2021 **Apple PhD Scholars in Artificial Intelligence and Machine Learning Fellowship**
Two-year fellowship with an annual stipend of $45,000 for graduate students in AI/ML.

2021 **Best Paper Award Finalist at ACM/IEEE HRI**
For the paper "Feature Expansive Reward Learning: Rethinking Human Input".

2021 **Best Paper Award Honorable Mention at IEEE T-RO**
For the paper "Quantifying Hypothesis Space Misspecification in Learning From Human-Robot Demonstrations and Physical Corrections".

2020 **Best Paper Award Winner at ACM/IEEE HRI**
For the paper "LESS is More: Rethinking Probabilistic Models of Human Behavior".

2020 **Human-Robot Interaction (HRI) Pioneers**
Chosen to participate in a highly selective workshop seeking to foster creativity, communication, and collaboration across Human-Robot Interaction.

2019 **Cadence Women in Technology Scholarship**
A $5,000 scholarship for women in EECS demonstrating leadership and a strong academic record.

2019 **IBM PhD Fellowship Finalist**
One of three students nominated by the EECS department at UC Berkeley.

2019 **Google PhD Fellowship Finalist**
One of four students nominated by the EECS department at UC Berkeley.

2018 **Microsoft Research Ada Lovelace Fellowship Finalist**
One of two students nominated by the EECS department at UC Berkeley.

2016 **Best Paper Award Winner at MICCAI Patch-MI**
For the paper "Patch-Based Discrete Registration of Clinical Brain Images".

2016 **Google Anita Borg Memorial Scholarship**
A $10,000 scholarship for women in EECS demonstrating leadership and a strong academic record.

2015–present **Member of Tau Beta Pi (TBP) National Honor Society for Engineering**
Honors society for engineering students with the strongest academic records at their university.

2015–present **Member of Eta Kappa Nu (HKN) National Honor Society for EECS**
Honors society for EECS students with the strongest academic records at their university.

Journal Articles

paper link **Learning Perceptual Concepts by Bootstrapping from Human Queries**
Andreea Bobu, Chris Paxton, Wei Yang, Balakumar Sundaralingam, Yu-Wei Chao, Maya Cakmak, Dieter Fox.
IEEE Robotics and Automation Letters (RA-L), 2022.
Also presented as an oral presentation at *Scaling Robot Learning (ICRA, 2022)* and as a spotlight at the IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2022.

paper link **Inducing Structure in Reward Learning via Feature Learning**
Andreea Bobu, Marius Wiggert, Claire Tomlin, Anca D. Dragan.
The International Journal of Robotics Research (IJRR), 2022.

paper link **Quantifying Hypothesis Space Misspecification in Learning from Human-Robot Demonstrations and Physical Corrections**
Andreea Bobu, Andrea Bajcsy, Jaime F. Fisac, Sampada Deglurkar, Anca D. Dragan.
IEEE Transactions on Robotics (T-RO), 2019.
Best paper award honorable mention.

Conference Publications

in review **Aligning Robot and Human Representations**
Andreea Bobu*, Andi Peng*, Pulkit Agrawal, Julie Shah, and Anca D. Dragan.
In submission to the Conference on Neural Information Processing Systems (NeurIPS), 2023.

to appear **Diagnosing and Augmenting Feature Representations in Correctional Inverse Reinforcement Learning**
Inês Lourenço, **Andreea Bobu**, Cristian R. Rojas, Bo Wahlberg.
IEEE Conference on Decision and Control (CDC), 2023.

paper link **Diagnosis, Feedback, Adaptation: A Human-in-the-Loop Framework for Test-Time Policy Adaptation**
Andi Peng, Aviv Netanyahu, Mark K. Ho, Tianmin Shu, **Andreea Bobu**, Julie Shah, Pulkit Agrawal.
International Conference on Machine Learning (ICML), 2023.

paper link **SIRL: Similarity-based Implicit Representation Learning**
Andreea Bobu*, Yi Liu*, Rohin Shah, Daniel S. Brown, and Anca D. Dragan.
ACM/IEEE International Conference on Human Robot Interaction (HRI), 2023.

paper link **Teaching Robots to Span the Space of Functional Expressive Motion**
Arjun Sripathy, **Andreea Bobu**, Zhongyu Li, Koushil Sreenath, Daniel S. Brown, and Anca D. Dragan.
IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2022.

paper link **Dynamically Switching Human Prediction Models for Efficient Planning**
Arjun Sripathy*, **Andreea Bobu***, Daniel S. Brown, Anca D. Dragan.
IEEE International Conference on Robotics and Automation (ICRA), 2021.

paper link **Situational Confidence Assistance for Lifelong Shared Autonomy**
Matthew Zurek*, **Andreea Bobu***, Daniel S. Brown, Anca D. Dragan.
IEEE International Conference on Robotics and Automation (ICRA), 2021.
Also presented as an oral presentation at *Lifelong Learning and Personalization in Long-Term Human-Robot Interaction (HRI, 2021).*

paper link **Feature Expansive Reward Learning: Rethinking Human Input**
Andreea Bobu*, Marius Wiggert*, Claire Tomlin, Anca D. Dragan.
ACM/IEEE International Conference on Human Robot Interaction (HRI), 2021.
Best paper award finalist.
Also presented at *AI & Its Alternatives in Assistive & Collaborative Robotics: Decoding Intent (RSS, 2020)* and *Workshop on Human in the Loop Learning (ICML, 2020).*

paper link **LESS is More: Rethinking Probabilistic Models of Human Behavior**
Andreea Bobu*, Dexter Scobee*, Jaime F. Fisac, Shankar Sastry, Anca D. Dragan.
ACM/IEEE International Conference on Human Robot Interaction (HRI), 2020.
Best paper award winner.

paper link **Learning Under Misspecified Objective Spaces**
Andreea Bobu, Andrea Bajcsy, Jaime F. Fisac, Anca D. Dragan.
Conference on Robot Learning (CoRL), 2018.
Invited to special issue.

Workshop Publications

preprint link **Time-Efficient Reward Learning via Visually Assisted Cluster Ranking**
David Zhang, Micah Carroll, **Andreea Bobu**, Anca D. Dragan.
Workshop on Human-in-the-Loop Learning, NeurIPS 2022.

paper link **Efficient Robot Teaching by Learning Intermediate Human-Guided Representations**
Andreea Bobu.
Companion of the Robotics: Science and Systems (RSS), 2022.

preprint link **Aligning Robot Representations with Humans**
Andreea Bobu, Andi Peng.
Workshop on Collaborative Robots and the Work of the Future, ICRA 2022.
Also presented at *Social Intelligence in Humans and Robots (RSS, 2022).*

paper link **Detecting Hypothesis Space Misspecification in Robot Learning from Human Input**
Andreea Bobu, Anca D. Dragan.
Companion of the ACM/IEEE International Conference on Human-Robot Interaction, 2020.

paper link **Adapting to Continuously Shifting Domains**
Andreea Bobu, Eric Tzeng, Judy Hoffman, Trevor Darrell.
Workshop at the International Conference on Learning Representations (ICLR), 2018.

paper link **Patch-Based Discrete Registration of Clinical Brain Images**
Adrian V. Dalca, **Andreea Bobu**, Natalia S Rost, Polina Golland.
Patch-based Techniques in Medical Imaging (MICCAI Patch-MI), 2016.
Best paper award winner.

Patents

patent link **Concept Training Technique for Machine Learning**
Andreea Bobu, Balakumar Sundaralingam, Christopher Jason Paxton, Maya Cakmak, Wei Yang, Yu-Wei Chao, Dieter Fox.
U.S. Patent 17982401.

Work Experience

Summer 2021 — **NVIDIA Corporation** — *Seattle, WA*
Research Intern under Prof. Maya Cakmak and Dieter Fox
- Developed a method for learning perceptual concepts describing multi-object prepositional relationships from a small amount of human input.
- Demonstrated the learned concepts in motion planning tasks on a 7-DoF Franka Panda robot arm.
- Published a paper in the IEEE Robotics and Automation Letters (RA-L), 2022.

2016–2017 — **MIT Computer Science and Artificial Intelligence Laboratory** — *Cambridge, MA*
Undergraduate Researcher under Prof. Polina Golland and Stefanie Jegelka
- Utilized machine learning techniques (principal component analysis, Gaussian mixture models, and latent topic models) to construct 3D representations for leukoaraiosis, a small vessel brain disease.
- Predicted diseased areas in the brain by modeling white matter hyperintensity in 3D brain images.

Summer 2015 — **Microsoft** — *Cambridge, MA*
Software Development Intern
- Helped build a health-oriented food-tracking application for the Microsoft Band.
- Developed the entire back-end side of the cloud server used for the application.
- Implemented part of the user interface and helped create user studies (C#, node.js, Azure).

2015–2017 — **MIT Computer Science and Artificial Intelligence Laboratory** — *Cambridge, MA*
Undergraduate Researcher under Prof. Polina Golland and Dr. Adrian Dalca
- Utilized machine learning, inference, and image analysis techniques to create a patch-based discrete image registration algorithm for sparse 3D brain images in MATLAB.
- Released code that is applicable to a variety of image shapes, dimensions, and modalities. The open-source code can be found here.
- Published a paper in the MICCAI Patch-MI workshop 2016 that won **Best Paper Award**.

Summer 2014 — **Bloomberg** — *New York, NY*
Research and Development Intern (Software Development)
- Developed a unit-testing framework for a large-scale C++ system (Internal and Web Applications team).
- Winner of the B-Puzzled algorithmic competition – out of approximately 20 teams.

Spring 2014 — **MIT Koch Institute for Integrative Cancer Research** — *Cambridge, MA*
Undergraduate Researcher under Prof. Daniel Anderson
- Utilized NLP tools to mine biomedical literature for drug and toxin biodistribution in the human body.
- Created an ontological tree of human organ subparts and worked on linking mined chemicals to the organ area where they are most prevalent.

Teaching

Spring 2021 — **CS 287H: Algorithmic Human-Robot Interaction** — *UC Berkeley*
Graduate Student Instructor
Created and graded weekly quizzes and hands-on programming homework assignments, brainstormed and provided feedback on project proposals, led some of the lectures, and guest lectured.

Fall 2019 — **CS 188: Introduction to Artificial Intelligence** — *UC Berkeley*
Graduate Student Instructor
Taught a weekly one-hour discussion section of 30 students, held weekly office hours, designed and graded homework and exams.

January 2016 — **6.178: Introduction to Software Engineering in Java** — *MIT*
Instructor and Lecturer
Co-organized and taught a 70-student course, held regular office hours, and designed and graded homework.

2015–2017 — **6.046: Design and Analysis of Algorithms** — *MIT*
Tutor
Tutored students in the class as part of Tau Beta Pi's Tutoring Committee.

Spring 2014 — **6.01: Introduction to Electrical Engineering and Computer Science** — *MIT*
Student Lab Assistant
Assisted my peers in completing the weekly lab assignments.

Invited Talks

Aligning Robot and Human Representations

2023 **Center for Human-Compatible AI Workshop** *CHAI*
2023 **Stanford Robotics Seminar** *Stanford*
2023 **Department Seminar** *Cornell*
2023 **Department Seminar** *Princeton*
2023 **Department Seminar** *Georgia Tech*
2023 **Department Seminar** *UCSD*
2023 **Department Seminar** *UPenn*
2023 **Department Seminar** *Brown*
2023 **Department Seminar** *NYU*
2023 **Department Seminar** *MIT*
2023 **Department Seminar** *UT Austin*
2023 **Department Seminar** *University of Maryland*
2023 **Department Seminar** *University of Michigan*
2023 **Department Seminar** *UIUC*
2023 **Microsoft Research Seminar Series** *MSR*
2022 **UW Robotics Colloquium** *UW*
2022 **New Trends in Aerospace Seminar Series** *MIT*
2022 **Cornell Robotics Seminar** *Cornell*
2022 **CS 6960: Human-AI Alignment** *U of Utah*
2022 **Robot Autonomy and Interactive Learning (RAIL) Lab** *Georgia Tech*
2022 **Illinois Robotics Seminar** *UIUC*
2022 **Intelligent and Interactive Autonomous Systems Group (ILIAD) Group** *Stanford*
2022 **Workshop on Complex Feedback in Online Learning** *ICML*
2022 **Workshop on AI and Humanity** *UC Berkeley*
2022 **AI/ML Seminar** *Apple*

Inducing Structure in Robot Learning via Human-Guided Representations

2022 **SemiAutonomous Vehicles Seminar** *UC Berkeley*
2021 **Workshop on Aware Learning: How to Benefit from Priors** *CDC*
2021 **Interactive Robotics Group** *MIT*
2021 **Workshop on Human-AI Collaboration in Sequential Decision-Making** *ICML*
2021 **Human And Robot Partners (HARP) Lab Reading Group** *CMU*
2021 **Internal Research Seminar** *Apple*
2021 **CS287H: Algorithmic Foundations of Human-Robot Interaction** *UC Berkeley*

Feature Expansive Reward Learning: Rethinking Human Input

2022 **BAIR Robotics and Systems Workshop** *UC Berkeley*
2021 **BAIR Commons Symposium** *UC Berkeley*
2021 **CMSC-33281: Topics in Human-Robot Interaction** *UChicago*

LESS is More: Rethinking Probabilistic Models of Human Behavior

2020 **Multi-Agent Reinforcement Learning Seminar** *UC Berkeley*

Learning Under Misspecified Objective Spaces

2020 **CS287H: Algorithmic Foundations of Human-Robot Interaction** *UC Berkeley*
2018 **Center for Human-Compatible Artificial Intelligence** *UC Berkeley*

Domain Adaptation for Fixed and Continuously Varying Domains

2018 **Berkeley Artificial Intelligence Research (BAIR) Seminar Series** *UC Berkeley*

Organized Workshops & Seminars

July 2023 **Workshop on Interactive Learning with Implicit Human Feedback** *ICML*
Co-Organizer
Bringing together interdisciplinary experts in interactive machine learning, reinforcement learning, human-computer interaction, cognitive science, and robotics to explore and foster discussions on challenges in interactive learning with implicit human feedback.

December 2022 **Workshop on Aligning Robot Representations with Humans** *CoRL*
Co-Organizer
Bringing together robot learning, cognitive science, human-robot interaction, and representation learning experts to better understand how humans and robots can align their representations for better interaction.

2022–2023 **Dream/CPAR Seminar** *UC Berkeley*
Lead Organizer
Weekly seminar hosting professors/professionals in robotics, control, human-centered autonomy.

June 2021, June 2022 **Social Intelligence in Humans and Robots Workshop** *ICRA, R:SS*
Co-Organizer
Brought together cognitive science and developmental psychology experts to better understand human social intelligence, and AI and robotics experts to discuss engineering socially intelligent artificial agents.

July 2020 **Advances and Challenges in Imitation Learning for Robotics Workshop** *R:SS*
Co-Organizer
Brought together AI and robotics experts to discuss the challenges facing imitation learning for robotics.

2020–2021 **SemiAutonomous Vehicles Seminar** *UC Berkeley*
Co-Organizer
Weekly robotics and controls seminar for students and professors internal and external to Berkeley.

Research Mentorship

2021–2023 **Regina Wang (now Masters student at Stanford University)**
Research on robot reward learning from multiple types of human input.

2021–2023 **Yi Liu (now Masters student at University of California, Berkeley)**
Research on learning rewards by first learning task-agnostic representations from human input.

2021–2022 **David Zhang (Undergraduate at University of California, Berkeley)**
Research on a more efficient visual interface for learning complex rewards from human input.

2020–2022 **Arjun Sripathy (now ML Scientist at Tesla)**
Research on meta-planning with a fleet of human models, and learning representations for expressive robot motions using human input and active learning.

2020–2021 **Matthew Zurek (now PhD student at the University of Wisconsin-Madison)**
Research on confidence-aware shared autonomy.

2018–2019 **Sampada Deglurkar (now PhD student at University of California, Berkeley)**
Research on confidence-aware learning from human input.

Outreach

Summer 2019 **Girls in Engineering Camp** *UC Berkeley*
Lecturer and Mentor
I co-organized one of the Self-Driving Cars workshops, where I got to teach the girls about sensing, planning, and control in autonomous driving, and work together on experimenting with an Evo robot.

August 2018 **AI4ALL** *UC Berkeley*
Teaching Assistant
I mentored a team of underrepresented high school students as they learned to train a deep reinforcement learning agent in MuJoCo.

2018–present **Berkeley Artificial Intelligence Research** *UC Berkeley*

Mentor

I have been meeting up regularly with underrepresented undergraduate students and mentoring them in research and career planning. I helped one student find a robotics summer internship, a research position in robotics lab, and a Master's position at UC Berkeley.

2018–2019 **Women in Computer Science and Engineering** *UC Berkeley*

Mentor

I mentored early-stage female PhD students in career planning and navigating life at UC Berkeley.

2016 **Women in Science and Engineering** *MIT*

Mentor

I mentored high school girls from the Greater Boston area during monthly sessions designed to introduce them to engineering at MIT.

2013–2015 **Educational Studies Program** *MIT*

Lecturer

I taught courses on "Water Security in Asia", "Introduction to Probability", and "Group Theory" to middle school students in the New England region.

Review Activities

2023 IEEE Robotics and Automation Letters (RA-L)

2021-2022 IEEE Transactions on Robotics (T-RO)

2022 IEEE Transactions on Mechatronics (T-MECH)

2022 ACM Transactions on Human-Robot Interaction (T-HRI)

2020 Nature: Machine Intelligence

2020-2023 ACM/IEEE International Conference on Human-Robot Interaction (HRI)

2021-2022 IEEE International Conference on Robotics and Automation (ICRA)

2021-2022 IEEE International Conference on Intelligent Robots and Systems (IROS)

2021, 2023 Robotics: Science and Systems (R:SS)

2021-2023 Conference on Robot Learning (CoRL)

2023 Learning for Dynamics & Control Conference (L4DC)

2021-2022 Companion of the International Conference on Human-Robot Interaction (HRI Pioneers)

2021-2022 Companion of the Robotics: Science and Systems (RSS Pioneers)

2022 Workshop on Progress and Challenges in Building Trustworthy Embodied AI (NeurIPS)

2022 Workshop on Collaborative Robots and the Work of the Future (ICRA)

2022 Workshop on Gamification and Multiagent Solutions (ICLR)

2021 Cooperative AI at Conference on Neural Information Processing Systems (NeurIPS)

2019 Adaptive & Multitask Learning at International Conference on Machine Learning (ICML)